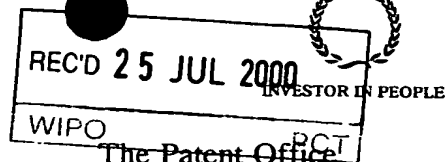




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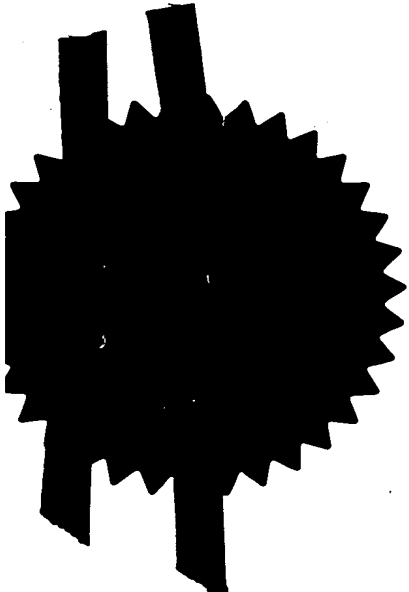
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1.	Your reference	5005 GB/JEB		
2.	Patent application number (The Patent Office will fill in this)	9915040.1		
3.	Full name, address and postcode of the or of each applicant (<u>underline all surnames</u>)	Willsher & Quick Ltd., Walrow Industrial Estate, Highbridge Somerset TA9 4AQ		
	Patents ADP number (if you know it)	0716899000		
	If the applicant is a corporate body, give the country/state of its incorporation	United Kingdom		
4.	Title of the invention	FRAME STRUCTURE FOR AN ENCLOSURE FOR ELECTRICAL EQUIPMENT		
5.	Name of your agent (if you have one) "Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	Abel & Imray 20 Red Lion Street London WC1R 4PQ		
	Patents ADP number (if you know it)	174001		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day/month/year)
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Description 12

Claim(s) 4

Abstract

Drawing(s) 3 f3

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Priority documents

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*) 1

Request for substantive examination (*Patents Form 10/77*)

Any other documents
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11.

I/We request the grant of a patent on the basis of this application.

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Date

Abel & Imray

ABEL & IMRAY

28th June 1999

12. Name and daytime telephone number of person to contact in the United Kingdom

Julian Bardo

0171 242 9984

Frame structure for an enclosure for electrical equipment

The invention relates to a frame structure for a rack for electrical equipment. The invention also relates to a
5 rack for electrical equipment, and to a flat pack from which such a rack can be formed. The rack will usually be clad with panels and thus take the form of what is referred to herein as an enclosure, but it may also be used without such panels.

10 It is well known to provide an enclosure that comprises a frame made up of various members with panels secured over the frame. At least some of the panels may be detachable to improve access to the frame. Commonly, the frame is a cuboidal frame and the frame members are
15 connected to one another at each of the corners of the frame. Thus, at each corner one vertical member and two horizontal members are connected together. To assemble the frame, it is then necessary merely to complete whatever assembly is required at each corner.

20 A wide variety of arrangements for corner connections of frame members are known. One common approach is to provide as a separate member a corner joint having three orthogonal projections each of which provides a fixing facility for a respective frame member. Providing such an

additional member can be very effective but leads to additional cost and complication.

It is an object of the invention to provide a frame structure which is effective but is inexpensive to manufacture and/or easy to assemble.

In a first aspect, the present invention provides a frame structure for a rack for electrical equipment, the frame structure comprising a plurality of elongate members which are joined together at corners of the structure, the frame structure including a corner joint at which two horizontal frame members and one vertical frame member are joined together, the horizontal frame members and the vertical frame member including portions which are juxtaposed to one another and are secured together by a common fastener engaging the juxtaposed portions.

The frame structure can be made inexpensively and yet be easy to assemble because no additional corner member need be provided and a common fastener is used to join together the three frame members that form the corner joint, thereby offering a reduction in the total number of fastening operations that are required.

Preferably a hole is provided in each of the three portions and the common fastener passes through the holes. The fastener may for example comprise male and female

threaded parts. Instead of a hole a part of a member may be omitted or cut-away to provide a gap or slot or some other opening and it is also possible, although not preferred, for two of the juxtaposed portions on opposite
5 outer sides of the middle juxtaposed portion to have an appropriate fastening means engaging their inner faces in some way and thereby securing the members together.

Preferably a first one of the frame members is of hollow section and a second one of the frame members passes
10 through an opening in a wall of the first frame member. Forming a frame member as a member of hollow section is not itself a novel proposal and frame members of a variety of hollow sections are known *per se*. By arranging for a second one of the frame members to pass through an opening
15 in a wall of the first frame member, it becomes possible to maintain substantial strength for the first frame member whilst facilitating the securing together of all three frame members by a common fastener. The opening may comprise a cut-away portion in the form of a slot but is
20 preferably a substantially rectangular hole. The size of the rectangular hole is preferably such that the second frame member fits freely, but preferably snugly, through the hole. In that case assembly remains straightforward and indeed alignment of the members for fastening can be

facilitated; furthermore extra resistance is provided against distortion of the corner joint after assembly.

Preferably a third one of the frame members passes through an opening in a further wall of the first frame member. Again the opening in the further wall is preferably defined by a substantially rectangular hole, and the third frame member is preferably a snug fit in the hole.

Preferably, the second frame member is of hollow section and the third frame member passes through an opening in a wall of the second frame member. In an embodiment of the invention described below, the opening in the wall of the second frame member is defined by cut-away portions of a pair of walls (flanges) of the second frame member; another possibility, however, would be to provide a rectangular hole. With arrangements of the kind just described it becomes a simple matter to arrange for portions of the three members to be juxtaposed to one another and secured together by a common fastener, but at the same time to provide a strong fixing. For example, this can easily be arranged by providing an end wall on the third frame member perpendicular to its longitudinal axis.

Various orientations of the corner joint are workable, but preferably the first frame member referred to above is the vertical frame member.

Whilst reference is made above to a common fastener
5 engaging the juxtaposed portions of the frame members, it should be understood that further fasteners may be provided engaging the same juxtaposed portions of the frame members or other parts of two or all three frame members. Thus, at least two of the frame members may include further portions
10 which are juxtaposed to one another and extend in planes transverse to the planes of the first-mentioned juxtaposed portions, the further juxtaposed portions being secured together by a further common fastener engaging the further juxtaposed portions. In an embodiment of the invention
15 described below a further fastener engages further juxtaposed portions of the second and third frame members. In the case where the first frame member extends vertically, the further fastener may also serve as a fastening location for a top panel of the enclosure (if the
20 corner joint is at the top of the enclosure) or for a bracket supporting a castor or the like (if the corner joint is at the bottom of the enclosure).

Preferably, the structure includes eight corner joints that are all substantially identical to each other, and the

horizontally extending frame members are all substantially identical to each other. In that way assembly can be simplified and manufacturing costs can be reduced. Furthermore the cross-sectional shape of the second and
5 third members can conveniently be identical.

Preferably, the frame structure is substantially cuboidal.

In a second aspect, the present invention provides a frame structure for a rack for electrical equipment, the
10 frame structure comprising a plurality of elongate members which are joined together at corners of the structure, the frame structure including a corner joint at which two horizontal frame members and one vertical frame member are joined together, a first one of the frame members being of
15 hollow section and a second one of the frame members passing through an opening in a wall of the first frame member.

The frame structure according to the second aspect of the invention may further comprise any of the features of
20 the frame structure according to the first aspect of the invention.

Where reference is made herein to an "enclosure", the term "enclosure" should not be taken to imply that there are continuous walls defining a fully closed space. In

general it is desirable for there to be panels fitted to the frame structure in order both for the connections to be protected and for persons to be protected from the connections. It should be understood however, that it is within the scope of the present invention to provide an enclosure with only some panels or indeed a rack without any panels.

The present invention further provides a rack for electrical equipment comprising a frame structure according to the invention. Preferably the rack is an enclosure and includes one or more panels secured to the frame structure.

The present invention further provides a flat pack comprising a plurality of frame members for assembly on site into a rack for electrical equipment as defined above.

Preferably the rack or enclosure is suitable for having connections of cables in a telecommunications or data communications network.

By way of example, an embodiment of the invention will now be described with reference to the accompanying drawings, of which:

Fig. 1 is a perspective view of a portion of a skeleton frame structure for a rack for telecommunications or data communications equipment;

Fig. 2 is an exploded view of the portion of the structure shown in Fig. 1; and

Fig. 3 is a perspective view of an entire skeleton frame structure.

5 Figs. 1 and 2 show a corner portion of a skeleton frame structure for a rack (which may be clad with panels to form an enclosure) suitable for housing connections of cables in a telecommunications or data communications network. The skeleton frame structure comprises four
10 vertically extending frame members and eight horizontally extending frame members joined together at their ends to define a cuboid. The skeleton frame structure therefore includes eight corner joints each comprising one vertically extending frame member joined to two horizontally extending
15 frame members. Figs. 1 and 2 illustrate one such corner joint. The other seven corner joints are substantially the same as that shown in Figs. 1 and 2.

The joint comprises a vertically extending member 1, a first horizontally extending member 2, and a second
20 horizontally extending member 3. Only one end of each member is illustrated. It will be understood that one of the members 2, 3 will extend along a side of the frame structure and the other of the members 2, 3 will extend along the front or rear of the frame structure. In the

particular example described the member 3 is a side member and the member 2 a rear member. All three members 1, 2, 3 are formed from sheet metal pressed into a desired configuration. The three members may also be formed by
5 extrusion, if desired.

The vertically extending member 1 is of generally square cross-section and comprises two adjacent, mutually perpendicular, outer walls 1a, 1b. The wall 1a is joined along one edge to the wall 1b and along an opposite edge to
10 a wall 1c which extends inwardly from the wall 1a perpendicular thereto. A portion of the wall 1c is cut away to form a rectangular hole 4. The wall 1b is joined along one edge to the wall 1a and along an opposite edge to a wall 1d which extends inwardly from the wall 1b
15 perpendicular thereto and carries a flange 1e on its distal edge, the flange 1e extending perpendicular to the wall 1d and away from the wall 1a. A portion of the wall 1d is cut-away to form a rectangular hole 5.

The rear member 2 is of generally rectangular cross-
20 section and comprises an outer wall 2a joined along each of its opposite side edges to walls 2b, 2c which project inwardly perpendicular to the wall 2a. Each wall 2b, 2c is formed along its inner edge with an internal flange 2d, 2e respectively, those flanges being disposed in a common

plane parallel to the wall 2a. The side member 3 is also of a similar generally rectangular cross-section including walls 3a, 3b, 3c and flanges 3d, 3e. Flanges 2d and 2e are each cut-away at their ends to leave gaps 8, 9 respectively, and circular holes 6, 7 are provided in the walls 2a, 2c respectively towards the ends of the walls. The side member 3 is formed with an end wall 3f perpendicular to the walls 3a, 3b, 3c and to the flanges 3d, 3e. A circular hole 10 is provided in the middle of the end wall 3f and a circular hole 11 is provided in the wall 3c towards the end of the wall. The corner joint is assembled by passing the illustrated end of the rear member 2 through the rectangular opening 4 in wall 1c of the vertically extending member 1 until the member 2 abuts the outer wall 1b of the member 1; at that stage, the hole 6 in the outer wall 2a of the rear member 2 is aligned with a hole 12 provided in the outer wall 1a of the vertically extending member 1. The side member 3 is then passed through the opening 5 in wall 1d of the vertically extending member 1 and subsequently through the gaps 8, 9 in the flanges 2d, 2e of the rear member 2 until the end wall 3f of the side member 3 abuts the inner side of the outer wall 2a of the rear member 2. At that stage, the hole 10 in the end wall 3f of the side member 3 is aligned

with the hole 6 in the wall 2a of the rear member 2, and with the hole 12 in the outer wall 1a of the vertically extending member 1; also, the hole 11 in the wall 3c of the side member 3 is aligned with the hole 7 in the wall 2c

5 of the rear member 2. The three members 1, 2, 3 are then secured together by passing a fastener 13 through holes 12, 6, 10 and a fastener 14 through holes 7, 11. If desired, for added strength, the three members 1, 2, 3 may each include a further hole (not shown) in their respective

10 walls 1a, 2a and 3f, the three further holes being positioned such that, once the skeleton frame structure has been assembled, the three further holes are aligned and a further fastener can be passed through the holes.

Conveniently the fastener in each case comprises a screw
15 threaded bolt that is passed from the outside of the frame structure through the holes and engages a screw threaded female member fixed on the inner face of the innermost juxtaposed wall (the wall 3f for the fastener 13 and the wall 3c for the fastener 14).

20 The members 2 and 3 fit freely but snugly through the rectangular holes 4 and 5 in the member 1. The snug fit both facilitates assembly of the corner joint and resists any significant movement of one frame member relative to another.

Fig. 3 shows a complete frame structure incorporating eight corner joints, each of which is substantially as described above. It will be appreciated that there are various options for the orientations of the various corner joints. In Fig. 3, the form of each end of each of the members 1, 2, 3 is the same, but another possibility for example would be to provide the member 2, one end of which is shown in Fig. 2, with its other end in the form of the end of member 3 that is shown in Fig. 2. In that case the other end of member 3 would be in the form of the end of member 2 that is shown in Fig. 2.

In Fig. 3, it may be seen that the side members 3 are provided on their flanges 3e with a row of holes to which for example mounting angles of a standard kind known per se may be fixed. Equipment such as cable connecting equipment and/or other electrical equipment can then be fixed to the mounting angles in the conventional way. Panels can also be attached to the frame structure by suitable means.

Claims

1. A frame structure for a rack for electrical equipment,
5 the frame structure comprising a plurality of elongate
members which are joined together at corners of the
structure, the frame structure including a corner joint at
which two horizontal frame members and one vertical frame
member are joined together, the horizontal frame members
10 and the vertical frame member including portions which are
juxtaposed to one another and are secured together by a
common fastener engaging the juxtaposed portions.
2. A frame structure according to claim 1, in which a hole
is provided in each of the three portions and the common
15 fastener passes through the holes.
3. A frame structure according to claim 1 or 2, in which a
first one of the frame members is of hollow section and a
second one of the frame members passes through an opening
in a wall of the first frame member.
- 20 4. A frame structure according to claim 3, in which the
opening is defined by a substantially rectangular hole.
5. A frame structure according to claim 3 or 4, in which a
third one of the frame members passes through an opening in
a further wall of the first frame member.

6. A frame structure according to claim 5, in which the opening in the further wall is defined by a substantially rectangular hole.

7. A frame structure according to claim 5 or 6, in which
5 the second frame member is of hollow section and the third frame member passes through an opening in a wall of the second frame member.

8. A frame structure according to claim 7, in which the opening in the wall of the second frame member is defined
10 by cut-away portions of one or more walls of the second frame member.

9. A frame structure according to any one of claims 3 to 8, in which the first frame member is the vertical frame member.

15 10. A frame structure according to any preceding claim, in which at least two of the frame members include further portions which are juxtaposed to one another and extend in planes transverse to the planes of the first-mentioned juxtaposed portions, the further juxtaposed portions being
20 secured together by a further common fastener engaging the further juxtaposed portions.

11. A frame structure according to claim 10, in which the further juxtaposed portions extend substantially horizontally.

12. A frame structure according to any preceding claim, wherein the structure includes eight corner joints that are all substantially identical to each other.

13. A frame structure according to any preceding claim,
5 wherein the frame structure is substantially cuboidal.

14. A frame structure for a rack for electrical equipment, the frame structure comprising a plurality of elongate members which are joined together at corners of the structure, the frame structure including a corner joint at
10 which two horizontal frame members and one vertical frame member are joined together, a first one of the frame members being of hollow section and a second one of the frame members passing through an opening in a wall of the first frame member.

15. A frame structure according to claim 14, in which a third one of the frame members passes through an opening in a further wall of the first frame member.

16. A frame structure according to claim 15, in which the second frame member is of hollow section and the third
20 frame member passes through an opening in a wall of the second frame member.

17. A frame structure substantially as described herein with reference to and as shown in the drawings.

18. A rack for electrical equipment comprising a frame structure according to any preceding claim.

19. A rack according to claim 18, in which the rack is an enclosure and includes one or more panels secured to the
5 frame structure

20. A rack according to claim 19, in which said at least one panel is releasable.

21. A flat pack comprising a plurality of frame members for assembling on site into a rack according to any of
10 claims 18 to 20.

FIG. 1

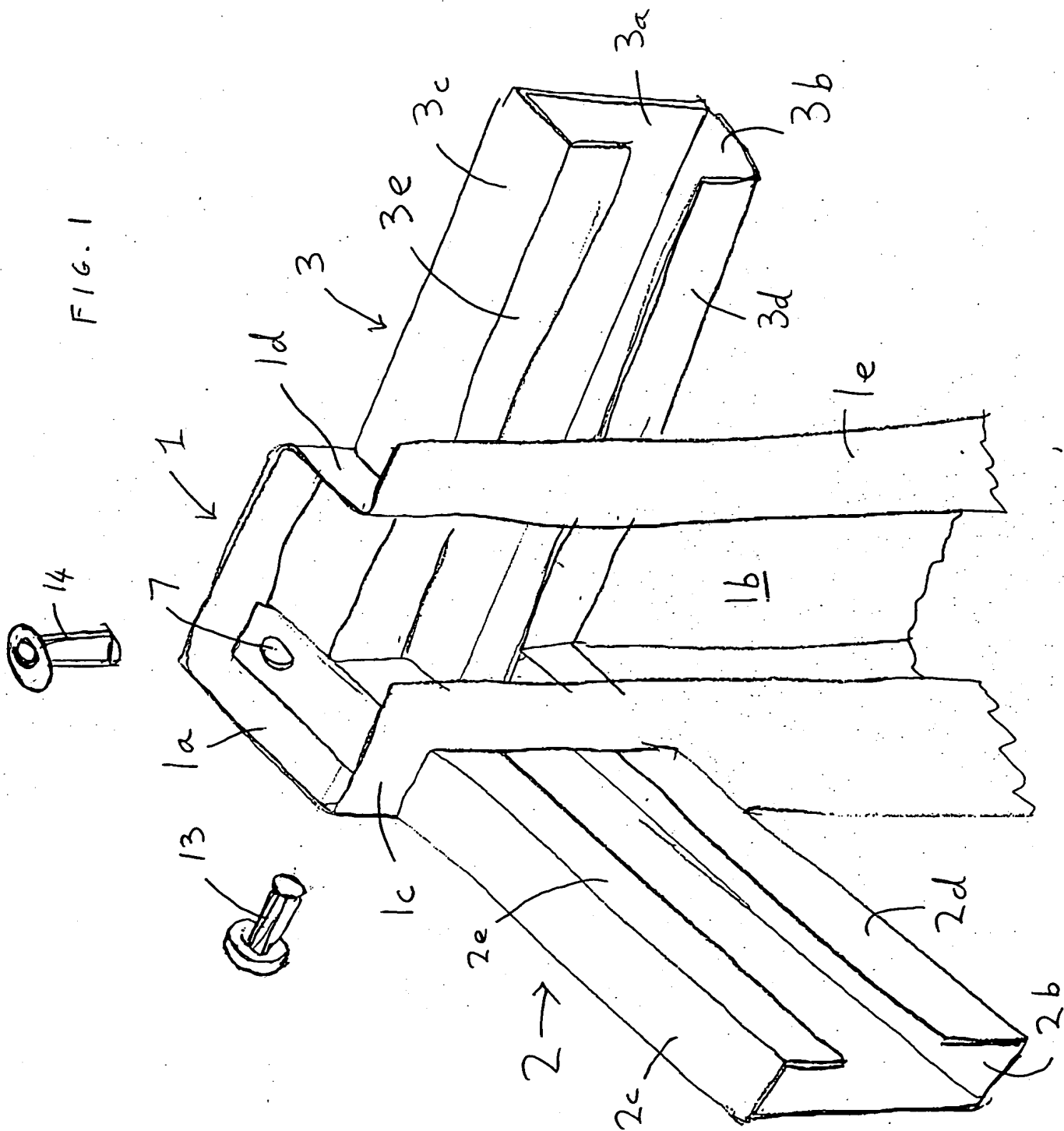


FIG. 2

